

DWG NO 277-0599	SH 1	REVISIONS																			
NOTES: DRAWING PREPARED IN ACCORDANCE WITH DOD-STD-100.		L	AU8597 - REV P 1, 2, 11.	92-01-22	SMH																
		M	AZ1608 - REV P 1-4, 12; SUBMIT NEW P 5-11, 13, 14 WITH NO CHGS.	95-10-28	SMH																

THIS DRAWING DEPICTS ITEMS UNDER HARDNESS ASSURANCE CONTROL (HAC). ALL CHANGES TO DESIGN, MATERIALS, MANUFACTURING PROCESSES, OR SUGGESTED SOURCES OF SUPPLY MUST BE EVALUATED FOR HARDNESS IMPACTS BY THE ENGINEERING ACTIVITY RESPONSIBLE FOR SURVIVABILITY. SEE PARAGRAPH 6.3 FOR PROGRAM APPLICABILITY OF HAC.

1.0 **SCOPE:** THIS DRAWING DETAILS THE REQUIREMENTS FOR A CRYSTAL CONTROLLED OSCILLATOR, FOR PORTABLE AND AIRBORNE APPLICATION, WITH A VERY RAPID WARM-UP TIME AND LOW POWER CONSUMPTION.

THE PART NUMBER IS THE SEVEN (7) DIGIT DRAWING NUMBER PLUS THE APPLICABLE DASH NUMBER AS SPECIFIED IN TABLE I.

MCCOY ELEC., MT HOLLY SPRINGS, PA.	00136	SEE TABLE I	TA
PIEZO TECH., INC., ORLANDO, FL.	25120	SEE TABLE I	TA

SUGGESTED SOURCES OF SUPPLY										CAGE CODE		VENDOR PART NO		CAL									
REV STATUS OF SHEETS	REV	M	M	M	M	M	M	M	M	M	M	M	M	M	K								
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

CLASS: 2 CC: 001102 U/M: SEE 6.3 VENDOR ITEM DRAWING

CONTRACT NO		ROCKWELL INTERNATIONAL CORPORATION COLLINS AVIONICS & COMMUNICATIONS DIVISION 350 COLLINS ROAD N E CEDAR RAPIDS, IA 52498			
PREP	S. K. MCKEE 86-02-05				
CHK	J. D. HOWLETT 86-02-05	OSCILLATOR, CRYSTAL CONTROLLED			
APVD	J. D. HOWLETT 86-02-05				
		SIZE	CAGEC	DWG NO	REV
		A	13499	277-0599	M
		SCALE	NONE	i277-0599m	SHEET 1 OF 15

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SH

2

- 2.0 APPLICABLE DOCUMENTS: THE FOLLOWING DOCUMENTS FORM A PART OF THIS DRAWING TO THE EXTENT SPECIFIED HEREIN.

MILITARY SPECIFICATIONS

MIL-O-55310
REVISION A

OSCILLATORS, CRYSTAL GENERAL
SPECIFICATION FOR

MILITARY STANDARDS

MIL-STD-202

TEST METHODS FOR ELECTRONIC AND
ELECTRICAL COMPONENT PARTS

ROCKWELL SPECIFICATIONS

357-0551

CONNECTOR, RADIO FREQUENCY
SPECIFICATION

371-2649

POWER CONNECTOR SPECIFICATION

INDUSTRY STANDARDS

ANSI Y14.5M-1982

DIMENSIONING AND TOLERANCING

- 3.0 REQUIREMENTS:

- 3.1 ELECTRICAL: (UNLESS OTHERWISE SPECIFIED, ELECTRICAL REQUIREMENTS APPLY OVER THE ENTIRE TEMPERATURE RANGE SPECIFIED.)

- 3.1.1 DIRECT CURRENT (DC) INPUTS:

- 3.1.1.1 INPUT VOLTAGE: $V_1=19.0$ TO 21.6 VOLTS DIRECT CURRENT (VDC)
 $V_2=11.0$ TO 16.0 VDC

- 3.1.1.2 SUPPLY RIPPLE AND NOISE: 200 MILLIVOLT (mV) PEAK TO PEAK SQUARE WAVE AT ANY FREQUENCY BETWEEN 100 HERTZ (Hz) AND 12.0 MEGAHERTZ (MHz).

- 3.1.1.3 INPUT POWER: MAXIMUM DEMAND DURING WARM-UP: 20 WATTS WITH V_1 EQUAL TO 20 (VDC); AFTER WARM-UP: 1.8 WATTS MAXIMUM AT -40°C WITH AMBIENT FORCED AIR COOLING AND V_1 EQUAL TO 20 VDC.

- 3.1.1.4 INPUT PROTECTION: OPENING OF A POWER SUPPLY OR GROUND CONNECTION DURING OPERATION MUST NOT CAUSE DAMAGE.

- 3.1.1.5 INPUT CURRENT: I_1 : 1.0 AMP MAXIMUM OVER THE V_1 RANGE;
 I_2 : 20 MILLIAMPS (mA) MAXIMUM OVER THE V_2 RANGE

SIZE

A

CAGEC

13499

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277-0599

REV

M

SCALE NONE

I277-0599m

SHEET 2

- 3.1.2 RADIO FREQUENCY (RF) OUTPUT: ALTERNATE CURRENT (AC) OR DIRECT CURRENT (DC) COUPLED TO GROUND.
- 3.1.2.1 FREQUENCY (f_0): 10.230 MHz.
- 3.1.2.1.1 FREQUENCY TOLERANCE: $f_0 \pm 1 \times 10^{-7}$ AT $25^\circ\text{C} \pm 3^\circ\text{C}$ AT THE TIME OF SHIPPING.
- 3.1.2.2 RF OUTPUT POWER: -1 dBm TO +2 dBm INTO A $50 \pm 5\%$ OHM RESISTIVE LOAD.
- 3.1.2.2.1 START-UP TIME: RF OUTPUT POWER SHALL MEET THE REQUIREMENTS OF 3.1.2.2 HEREIN WITHIN 500 MILLISECONDS OF THE APPLICATION OF THE MINIMUM INPUT VOLTAGES (V_1 AND V_2) IN ACCORDANCE WITH 3.1.1 HEREIN. THIS START-UP REQUIREMENT MUST BE MET WITH THE VOLTAGE APPLIED AS ANY ARBITRARY FUNCTION VERSUS TIME (IE: RAMP, STEP). TIME ZERO IS DEFINED AS THAT TIME WHEN V_1 AND V_2 BOTH REACH THEIR MINIMUM INPUT VOLTAGES.
- 3.1.2.3 OUTPUT PROTECTION: RF OUTPUT MUST BE NORMAL AFTER BEING SHORTED TO THE SUPPLY VOLTAGES OR TO GROUND FOR 5 SECONDS.
- 3.1.2.4 LOAD VOLTAGE STANDING WAVE RATIO (VSWR): RF OUTPUT MUST WITHSTAND CONTINUOUS APPLICATION OF LOADS OF ANY VSWR. (UNTERMINATED (OPEN) RG-58 COAXIAL CABLE OF ANY LENGTH UP TO 32 FEET).
- 3.1.2.5 RF GROUND: THE SHELL OF THE RF CONNECTOR SHALL BE CONNECTED TO CASE GROUND.
- 3.1.3 WARM-UP TIME: FROM A SIX (6) HOUR COLD SOAK START AT -40°C . THE FREQUENCY AFTER 3 MINUTES SHALL BE WITHIN 3×10^{-8} OF THE FREQUENCY AFTER 30 MINUTES. THE RATE OF CHANGE OF FREQUENCY AFTER 3 MINUTES SHALL NOT EXCEED $1 \times 10^{-9}/\text{SEC}$.
- 3.1.4 FREQUENCY STABILITY:
- 3.1.4.1 LONG TERM AGING: AT TIME OF SHIPPING: $2 \times 10^{-8}/\text{WEEK}$ MAXIMUM AFTER 24 HOURS OF CONTINUOUS OPERATION.

THE ABOVE AGING FIGURES APPLY ONLY DURING CONTINUOUS OPERATION. WHEN A UNIT IS OFF POWER FOR ANY PERIOD OF UP TO 30 DAYS, THE FREQUENCY 30 MINUTES AFTER TURN-ON SHALL BE WITHIN 1×10^{-8} OF THE FREQUENCY AFTER TURN-OFF BASED ON STORAGE AT 25°C . FOR LONGER OFF PERIODS THE ABOVE OFFSET SHALL NOT INCREASE BY MORE THAN $1 \times 10^{-9}/\text{WEEK}$.

- 3.1.4.2 AMBIENT STABILITY: $\pm 1 \times 10^{-8}$ MAXIMUM OVER THE RANGE -54°C TO $+85^{\circ}\text{C}$. ADDITIONALLY THE RATE OF FREQUENCY CHANGE SHALL NOT EXCEED $1 \times 10^{-9}/\text{SEC}$ FOR A TEMPERATURE RATE CHANGE OF $5^{\circ}\text{C}/\text{MINIMUM}$ OR LESS FROM -54°C TO $+85^{\circ}\text{C}$.
- 3.1.4.3 VOLTAGE STABILITY: $\pm 1 \times 10^{-9}$ FOR THE INPUT VOLTAGE RANGE SPECIFIED
- 3.1.4.4 LOAD STABILITY: $\pm 1 \times 10^{-8}$ FOR ANY LOAD VSWR LESS THAN OR EQUAL TO 2.
- 3.1.4.5 SHORT TERM STABILITY:
 1.0×10^{-10} ROOT MEAN SQUARE (RMS) FOR 0.2 SECOND MEASUREMENTS
 3.0×10^{-11} RMS FOR 1.0 SECOND MEASUREMENTS
 FOR THIS MEASUREMENT, THE SQUARE ROOT OF THE ALLAN VARIANCE, WITH 100 OR MORE SAMPLES, MAY BE USED.
- 3.1.4.6 SHORT TERM FREQUENCY DRIFT: $\pm 2 \times 10^{-9}$ FOR 20 MINUTES AT A CONSTANT TEMPERATURE AND AFTER 30 MINUTES WARM-UP PRIOR TO THE TEST, THE OSCILLATOR SHALL BE SUBJECTED TO A 24 HOUR MINIMUM "ON" PERIOD AT ROOM TEMPERATURE FOLLOWED BY A 24 HOUR MINIMUM "OFF" PERIOD AT -40°C . THE OUTPUT FREQUENCY SHALL BE MEASURED USING A TECHNIQUE WHICH RESULTS IN A RESOLUTION OF $\pm 1 \times 10^{-10}$ AND A MINIMUM ACCURACY OF $\pm 2.5 \times 10^{-10}$.
- 3.1.4.7 FREQUENCY SHIFT DUE TO SHOCK SHALL BE LESS THAN $\pm 1.5 \times 10^{-7}$.
- 3.1.4.8 ACCELERATION SENSITIVITY: $3 \times 10^{-10}/\text{G}$ MAXIMUM IN THE DIRECTION OF THE LONGEST AXIS. $2 \times 10^{-9}/\text{G}$ MAXIMUM IN THE DIRECTION OF THE TWO SHORTER AXES. MEASUREMENT SHALL BE PERFORMED IN A MANNER WHICH EXCLUDES THERMAL EFFECTS.
- 3.1.5 FREQUENCY ADJUSTMENT:
- 3.1.5.1 (-010 ONLY):
1. CONTROL: SCREWDRIVER SLOT ADJUSTMENT.
 2. RANGE: $\pm 1 \times 10^{-6}$ MINIMUM ($\pm 10.23 \text{ Hz}$); OR SUFFICIENT RANGE TO COMPENSATE FOR FREQUENCY DRIFT RESULTING FROM INTERMITTENT OPERATION OVER A PERIOD OF 15 YEARS. IN LATTER CASE, VENDOR MUST SUPPLY WORST CASE ANALYSIS TO JUSTIFY CHOICE OF ADJUSTMENT RANGE.
 3. RESOLUTION: SUFFICIENT TO MEET 3.1.2.1.1.

3.1.5.2 (-020 ONLY): FREQUENCY ADJUSTMENT IS NOT REQUIRED PROVIDED THE VENDOR SUPPLIES WORST CASE ANALYSIS DEMONSTRATING THAT INTERMITTANT OPERATION OVER A PERIOD OF 15 YEARS WILL NOT CAUSE THE OUTPUT FREQUENCY TO EXCEED THE RANGE OF 10.23 MHz $\pm 2 \times 10^{-6}$ (± 20.26 Hz).

3.1.6 UNDESIRE RF OUTPUTS:

3.1.6.1 HARMONIC OR SUBHARMONIC OUTPUT: -15 dBc MAXIMUM (DECIBEL (dB) RELATIVE TO f_0 CARRIER).

3.1.6.2 SPURIOUS OUTPUT: -80 dBc MAXIMUM.

3.1.6.3 PHASE NOISE DENSITY: SINGLE SIDED PHASE NOISE DENSITY IN A 1 Hz MEASUREMENT BANDWIDTH.

<u>DISPLACEMENT</u>	<u>MINIMUM LEVEL BELOW ITEM 3.1.2.2</u>
10 Hz	90 dB
100 Hz	100 dB
1000 Hz	110 dB
10000 Hz	120 dB

3.1.6.4 RESPONSE TO VIBRATION: DURING VIBRATION, THE TOTAL SINGLE SIDED POWER OF SPURIOUS OUTPUTS AT FREQUENCIES REMOVED FROM f_0 BY 100 Hz TO 30 KHz MUST BE NO GREATER THAN -50 dBc.

3.1.6.5 RESPONSE TO SUPPLY RIPPLE: WITH THE SPECIFIED POWER SUPPLY RIPPLE, THE TOTAL POWER OF SPURIOUS OUTPUTS AT FREQUENCIES REMOVED FROM f_0 BY 100 Hz TO 30 KHz MUST BE NO GREATER THAN -57 dBc.

3.1.7 BUILT IN TEST (BIT): THE UNIT SHALL INCLUDE CIRCUITRY TO MONITOR PROPER OPERATION OF THE OVEN AND OUTPUT SIGNAL VOLTAGE.

3.1.7.1 FAULT CONDITION:

3.1.7.1.1 BIT OUTPUT VOLTAGE: 0.8 VOLT MAXIMUM WHEN SINKING 0.1 mA.

3.1.7.1.2 RF LEVEL: BIT MUST INDICATE A FAULT CONDITION IF THE OUTPUT VOLTAGE DROPS BELOW 0.1 VRMS (-7 dBm, 50 OHMS).

3.1.7.1.3 OVEN TEMPERATURE: BIT MUST INDICATE A FAULT IF THE +20 VOLTS (V) SUPPLY IS NOT CONNECTED OR DURING INITIAL HIGH CURRENT DRAW ATTRIBUTED TO WARM-UP IN ACCORDANCE WITH 3.1.1.3.